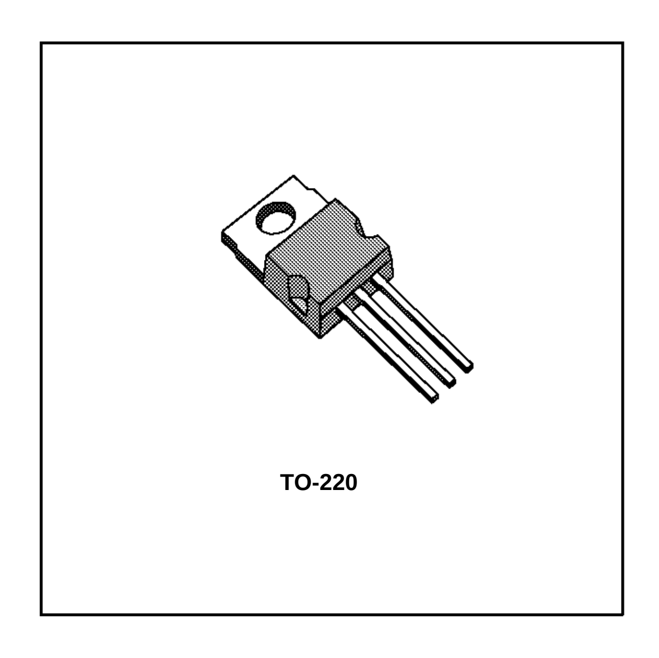


L4940 SERIES

VERY LOW DROP 1.5 A REGULATORS

- PRECISE 5 V, 8.5 V, 10 V, 12 V OUTPUTS
- LOW DROPOUT VOLTAGE (500 mV typ at 1.5A)
- VERY LOW QUIESCENT CURRENT
- THERMAL SHOUTDOWN
- SHORT CIRCUIT PROTECTION
- REVERSE POLARITY PROTECTION

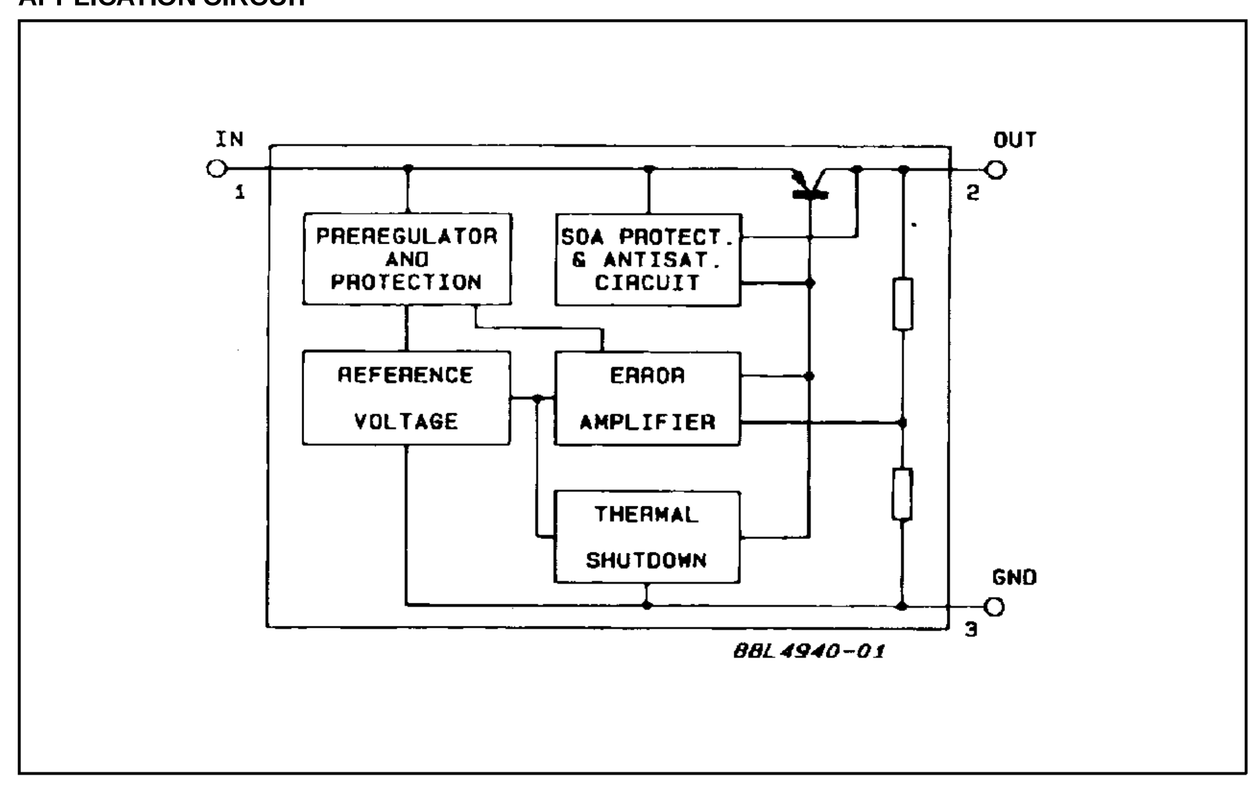


TO-220

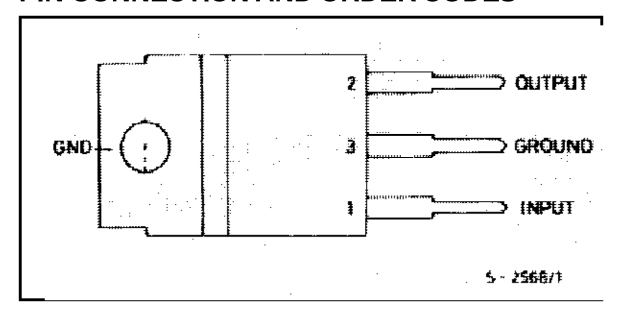
DESCRIPTION

The L4940 series of three terminal positive regulators is available in TO-220 package and with several fixed output voltages, making it useful in a wide range of industrial and consumer applications. Thanks to its very low input/output voltage drop, these devices are particularly suitable for battery powered equipments, reducing consumption and prolonging battery life. Each type employs internal current limiting, antisaturation circuit, thermal shutdown and safe area protection.

APPLICATION CIRCUIT



PIN CONNECTION AND ORDER CODES



ORDERING NUMBERS	OUTPUT VOLTAGE
L4940V5	5V
L4940V85	8.5V
L4940V10	10V
L4940V12	12V

ABSOLUTE MAXIMUM RATING

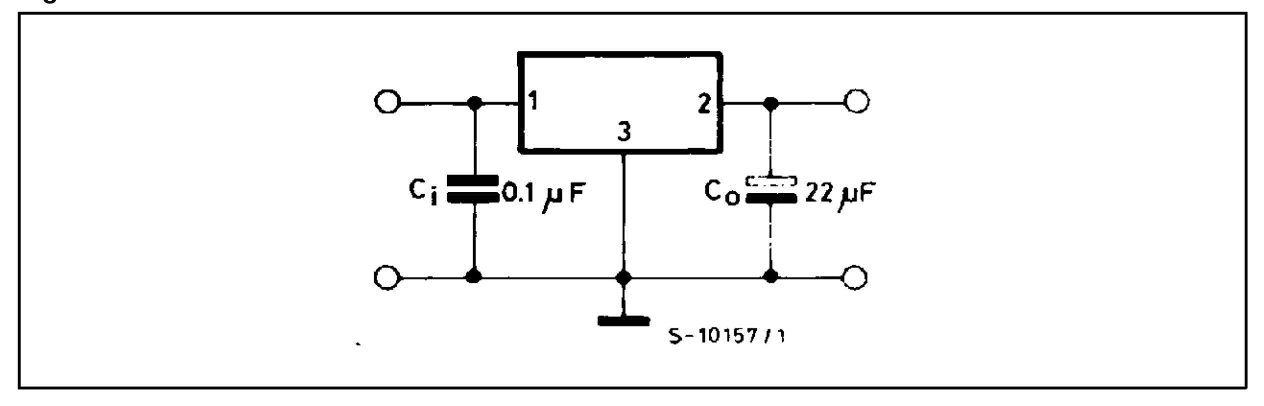
Symbol	Description			Values	Unit
V_I	Forward Input Voltage			30	V
V_{IR}	Reverse Input Voltage	V_O = 5 V	R_O = 100 Ω	-15	V
		V_O = 8.5 V	R_O = 180 Ω		
		V_O = 10 V	R_O = 200 Ω		
		V_O = 12 V	R_O = 240 Ω		
I_O	Output Current			Internally Limited	
P_{tot}	Power Dissipation			Internally Limited	
T_j, T_{stg}	Junction and Storage Temperature			-40 to 150	°C

THERMAL DATA

Symbol	Description		Value	Unit
$R_{th\text{-}j\text{-}case}$	Thermal Resistance Junction-case	Max	3	°C/W
$R_{th\text{-}j\text{-}amb}$	Thermal Resistance Junction-ambient	Max	50	°C/W

TEST CIRCUITS

Figure 1. - DC Parameters.



TEST CIRCUITS: (continued)

Figure 2. - Load Regulation

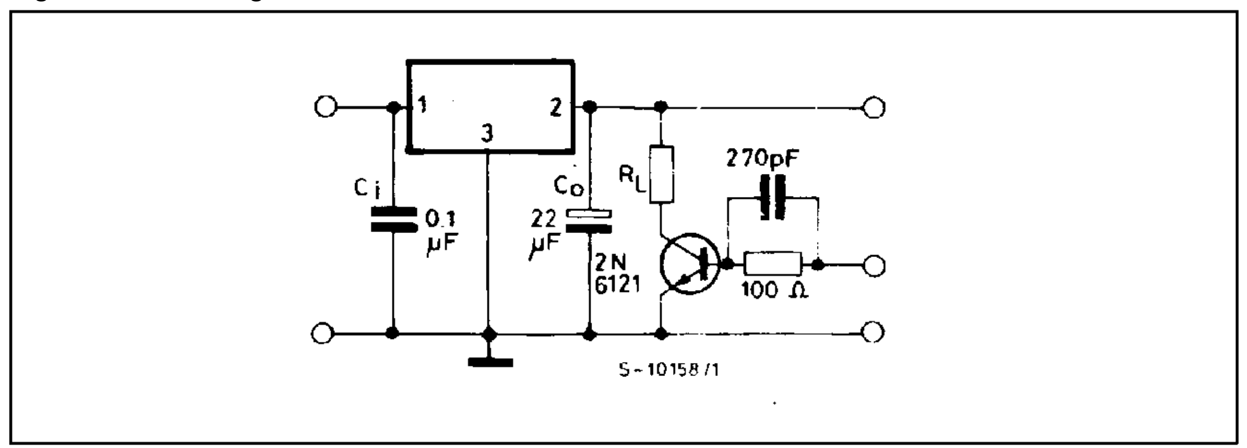
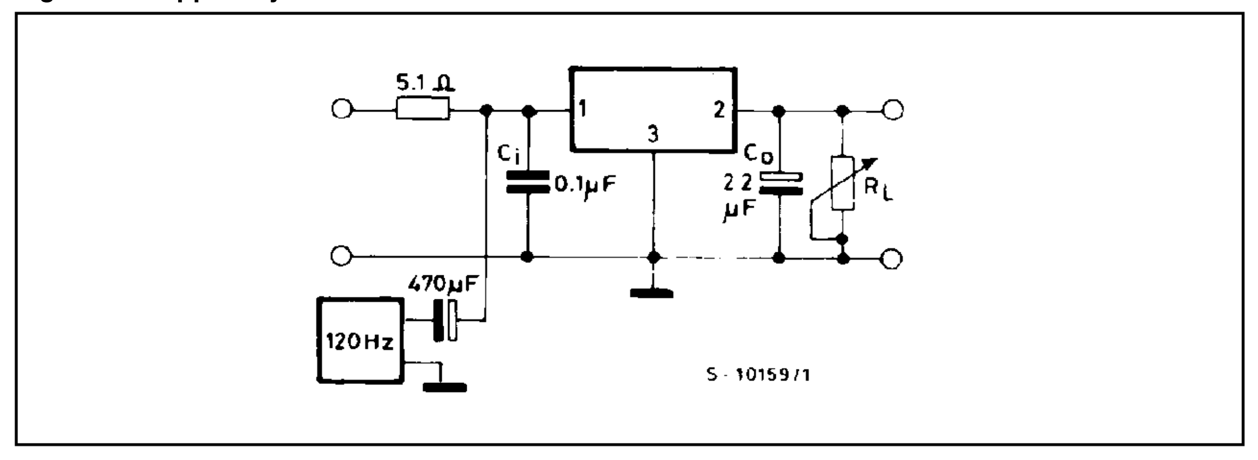


Figure 3. - Ripple Rejection



ELECTRICAL CHARACTERISTICS FOR L4940V5 (refer to the test circuits, T_j = 25 °C, V_i = 7V, C_i = 0.1 μF, C_o = 22 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	I_o = 500 mA	4.9	5	5.1	V
V_o	Output Voltage	I_o = 5 mA to 1500 mA V_i = 6.5 to 16 V	4.8	5	5.2	V
V_i	Operating Input Voltage	I_o = 5 mA			17	V
ΔV_o	Line Regulation	I_o = 5 mA V_i = 6 to 17 V		4	10	mV
ΔV_o	Load Regulation	I_o = 5 to 1500 mA I_o = 500 to 1000 mA		8 5	25 15	mV
I_Q	Quiscent Current	I_o = 5 mA I_o = 1.5 A V_i = 6.5 V		5 30	8 50	mA
ΔI_Q	Quiscent Current Change	I_o = 5 mA I_o = 1.5 A V_i = 6.5 to 16 V			3 15	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift			0.5		mV/°C
SVR	Supply Voltage Rejection	I_o = 1 A f = 120 Hz	58	68		dB
V_d	Dropout Voltage	I_o = 0.5 A I_o = 1.5 A		200 500	400 900	mV
I_{sc}	Short Circuit Current	V_i = 14 V V_i = 6.5 V		2 2.2	2.7 2.9	A
Z_o	Output Impedance	f = 1 KHz I_o = 0.5A		30		mΩ
e_N	Output Noise Voltage	B = 100 Hz to 100 KHz		30		μV/V_o

ELECTRICAL CHARACTERISTICS FOR L4940V85 (refer to the test circuits, T_j = 25 °C, V_i = 10.5V, C_i = 0.1 μF, C_o = 22 μF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	I_o = 500 mA	8.3	8.5	8.7	V
V_o	Output Voltage	I_o = 5 mA to 1500 mA V_i = 10.2 to 16 V	8.15	8.5	8.85	V
V_i	Operating Input Voltage	I_o = 5 mA			17	V
ΔV_o	Line Regulation	I_o = 5 mA V_i = 9.5 to 17 V		4	9	mV
ΔV_o	Load Regulation	I_o = 5 to 1500 mA I_o = 500 to 1000 mA		12 8	30 16	mV
I_Q	Quiscent Current	I_o = 5 mA I_o = 1.5 A V_i = 10.2 V		4 30	8 50	mA
ΔI_Q	Quiscent Current Change	I_o = 5 mA I_o = 1.5 A V_i = 10.2 to 16 V			2.5 15	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift			0.8		mV/°C
SVR	Supply Voltage Rejection	I_o = 1 A f = 120 Hz	58	66		dB
V_d	Dropout Voltage	I_o = 0.5 A I_o = 1.5 A		200 500	400 900	mV
I_{sc}	Short Circuit Current	V_i = 14 V V_i = 10.2 V		2 2.2	2.7 2.9	A
Z_o	Output Impedance	f = 1 KHz I_o = 0.5A		32		mΩ
e_N	Output Noise Voltage	B = 100 Hz to 100 KHz		30		μV/V_o

ELECTRICAL CHARACTERISTICS FOR L4940V10 (refer to the test circuits, T_j = 25 °C, V_i = 12V, C_i = 0.1 µF, C_o = 22 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	I_o = 500 mV	9.8	10	10.2	V
V_o	Output Voltage	I_o = 5 mA to 1500 mA V_i = 11.7 to 16 V	9.6	10	10.4	V
V_i	Operating Input Voltage	I_o = 5 mA			17	V
ΔV_o	Line Regulation	I_o = 5 mA V_i = 11 to 17 V		3	8	mV
ΔV_o	Load Regulation	I_o = 5 to 1500 mA I_o = 500 to 1000 mA		15 10	35 20	mV
I_Q	Quiscent Current	I_o = 5 mA I_o = 1.5 A V_i = 11.7 V		4 30	8 50	mA
ΔI_Q	Quiscent Current Change	I_o = 5 mA I_o = 1.5 A V_i = 11.7 to 16 V			2 13	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift			1		mV/°C
SVR	Supply Voltage Rejection	I_o = 1 A f = 120 Hz	56	62		dB
V_d	Dropout Voltage	I_o = 0.5 A I_o = 1.5 A		200 500	400 900	mV
I_{sc}	Short Circuit Current	V_i = 14 V V_i = 11.7 V		2 2.2	2.7 2.9	A A
Z_o	Output Impedance	f = 1 KHz I_o = 0.5A		36		mΩ
e_N	Output Noise Voltage	B = 100 Hz to 100 KHz		30		µV/V_o

ELECTRICAL CHARACTERISTICS FOR L4940V12 (refer to the test circuits, T_j = 25 °C, V_i = 14V, C_i = 0.1 µF, C_o = 22 µF unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_o	Output Voltage	I_o = 500 mV	11.75	12	12.25	V
V_o	Output Voltage	I_o = 5 mA to 1500 mA V_i = 13.8 to 17 V	11.5	12	12.5	V
V_i	Operating Input Voltage	I_o = 5 mA			17	V
ΔV_o	Line Regulation	I_o = 5 mA V_i = 13 to 17 V		3	7	mV
ΔV_o	Load Regulation	I_o = 5 to 1500 mA I_o = 500 to 1000 mA		15 10	35 25	mV
I_Q	Quiscent Current	I_o = 5 mA I_o = 1.5 A V_i = 13.8 V		4 30	8 50	mA
ΔI_Q	Quiscent Current Change	I_o = 5 mA I_o = 1.5 A V_i = 13.8 to 16 V			1.5 10	mA
$\frac{\Delta V_o}{\Delta T}$	Output Voltage Drift			1.2		mV/°C
SVR	Supply Voltage Rejection	I_o = 1 A f = 120 Hz	55	61		dB
V_d	Dropout Voltage	I_o = 0.5 A I_o = 1.5 A		200 500	400 900	mV
I_{sc}	Short Circuit Current	V_i = 14 V		2	2.7	A
Z_o	Output Impedance	f = 1 KHz I_o = 0.5A		40		mΩ
e_N	Output Noise Voltage	B = 100 Hz to 100 KHz		30		µV/V_o

Figure 4. Dropout voltage vs. Output Current

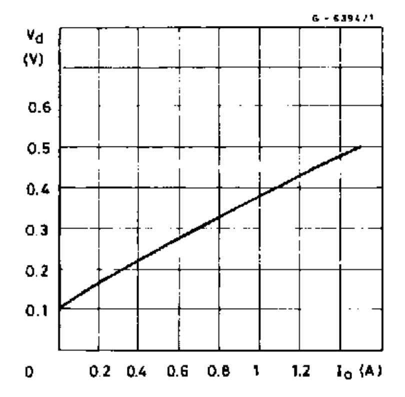


Figure 5. Dropout Voltage vs. Temperature

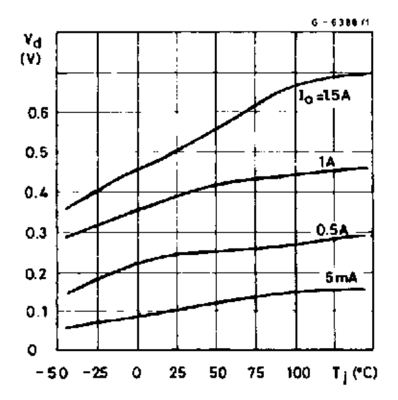


Figure 6. Output voltage vs. Temperature (L4940V5).

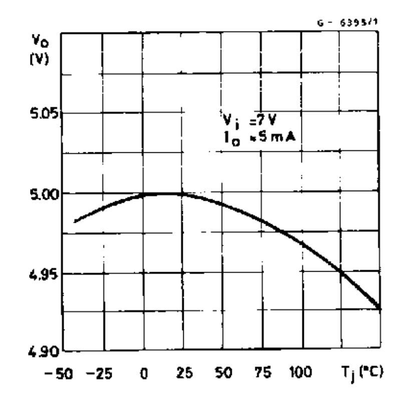


Figure 7. Output Voltage vs. Temperature (L4940V85).

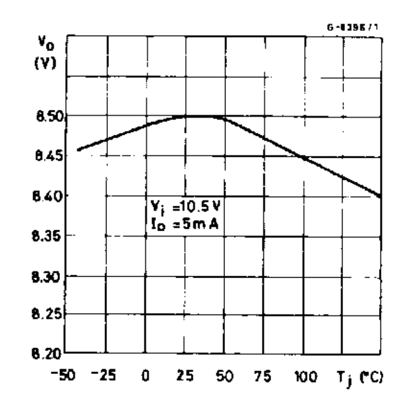


Figure 8. Output voltage vs. Temperature (L4040V10).

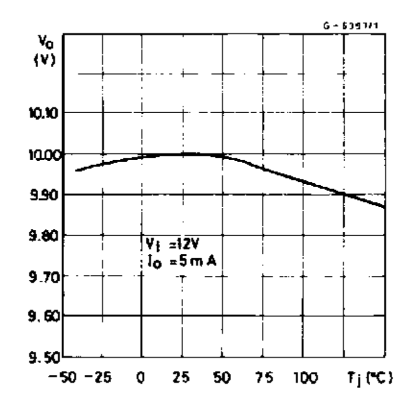


Figure 9. Output Voltage vs. Temperature (L4940V12).

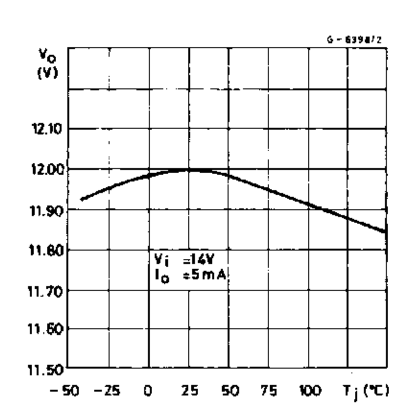


Figure 10. Quiescent Current vs. Temperature (L4940V5).

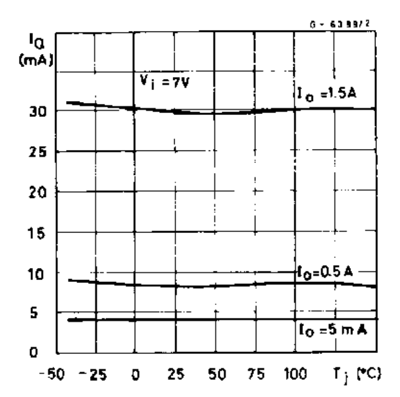


Figure 11. Quiescent Current vs. Input Voltage (L4940V5).

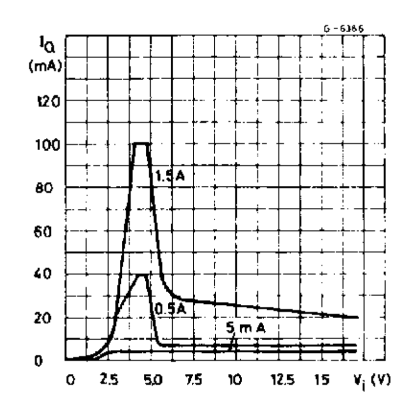


Figure 12. Quiescent Current vs. Output Current (L4940V5).

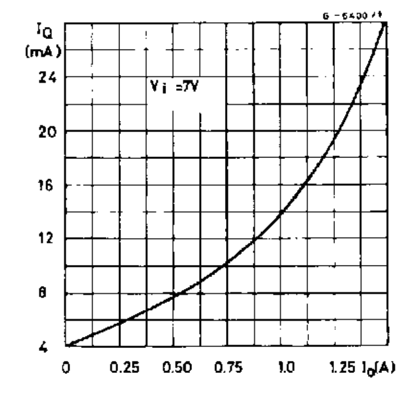


Figure 13. Short-circuit Current vs. Temperature (L4940V5).

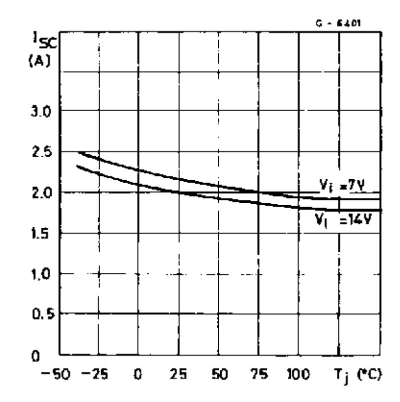


Figure 14. Peak Output Current vs. Input/Output Differential Voltage (L4940V5).

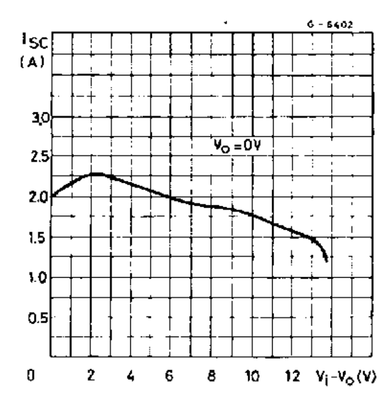


Figure 15. Low Voltage Behavior (L4940V5).

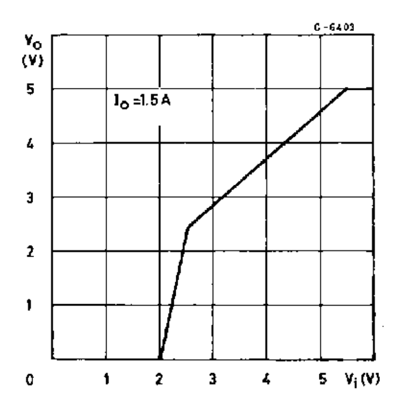


Figure 16. Low Voltage Behavior (L4940V85).

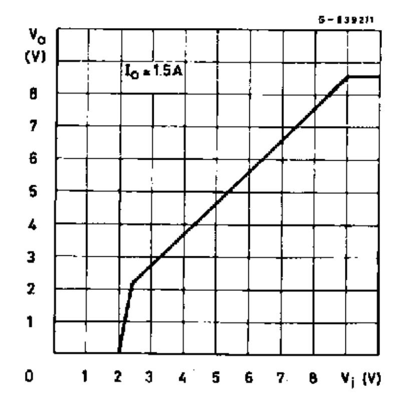


Figure 17. Low Voltage Behavior (L4940V10).

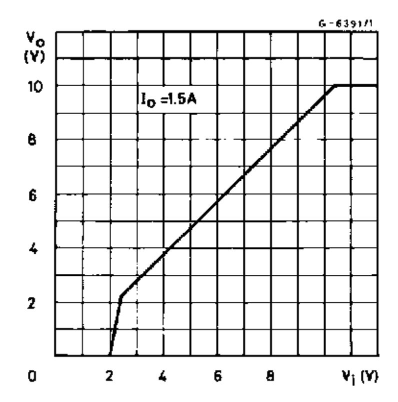


Figure 18. Low Voltage Behavior (L4940V12).

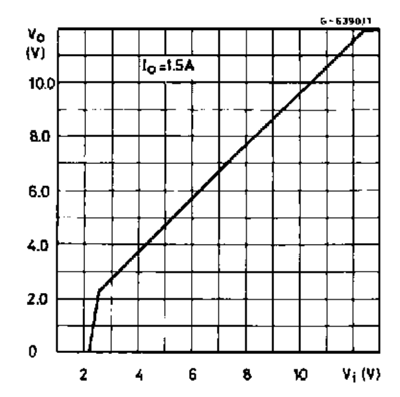


Figure 19. Supply Voltage Rejection vs. Frequency (L4940V5).

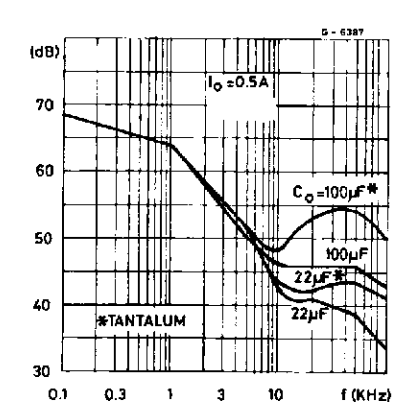


Figure 20. Supply Voltage Rejection vs. Output Current.

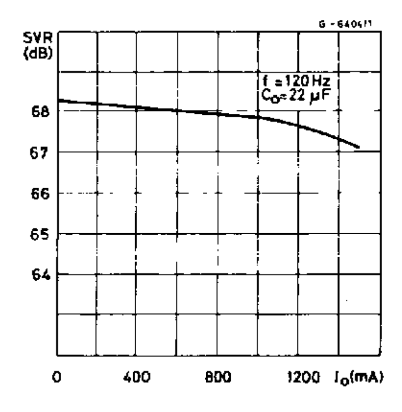


Figure 21. Load Dump Characteristics (L4940V5).

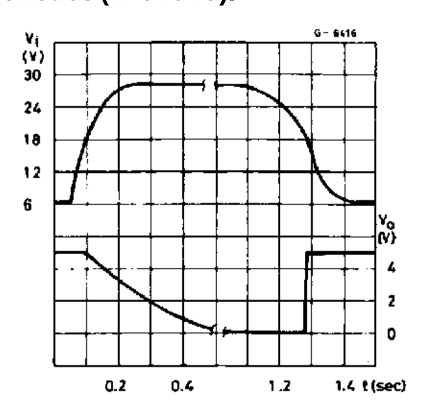


Figure 22. Line Transient Response (L4940V5).

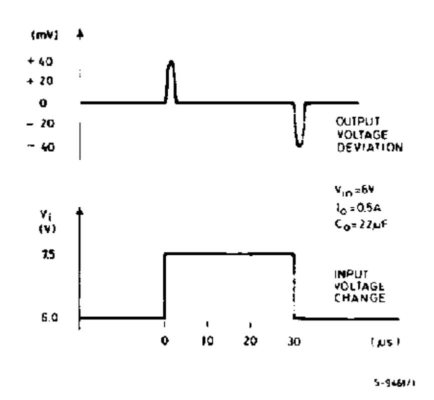


Figure 23. Load Transient Response.

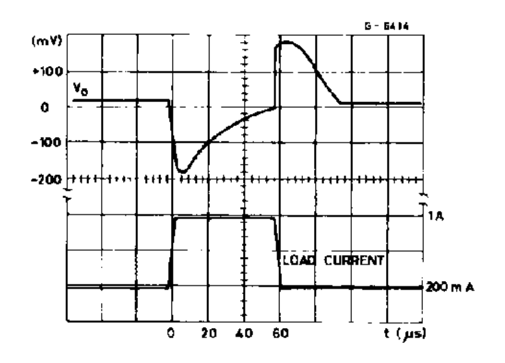


Figure 24. Total Power Dissipation.

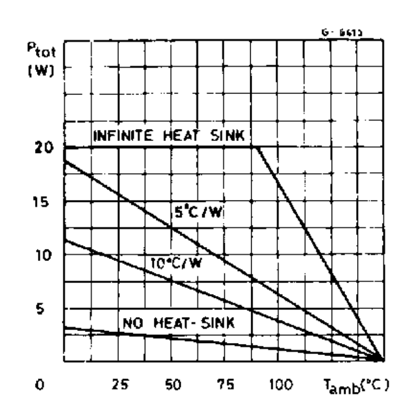


Figure 25. Distributed Supply with On-card L4940 and L4941 Low-drop Regulators.

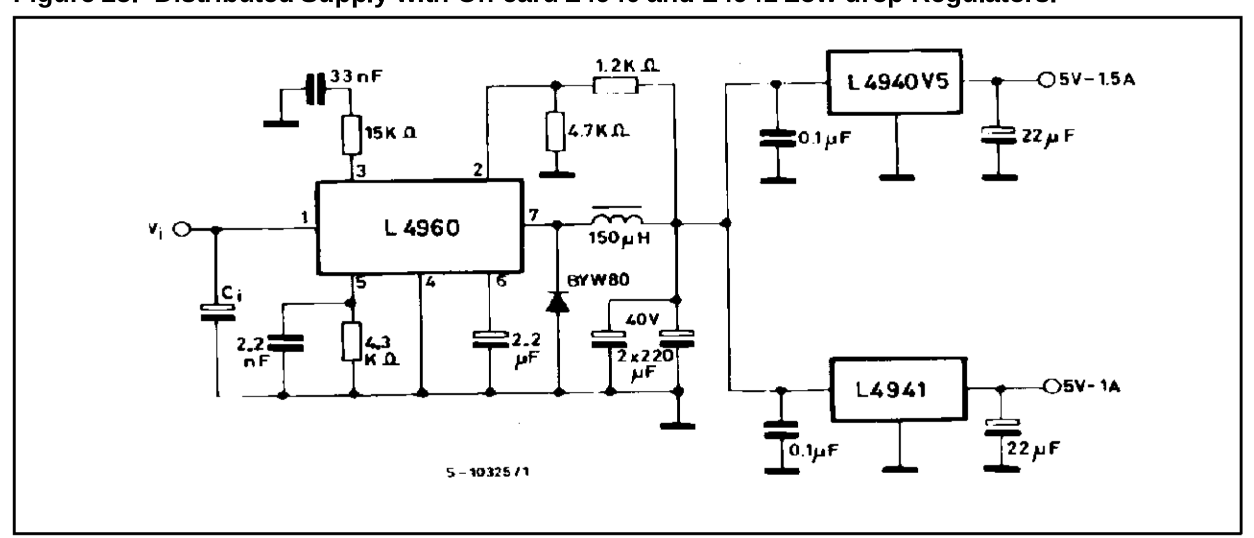
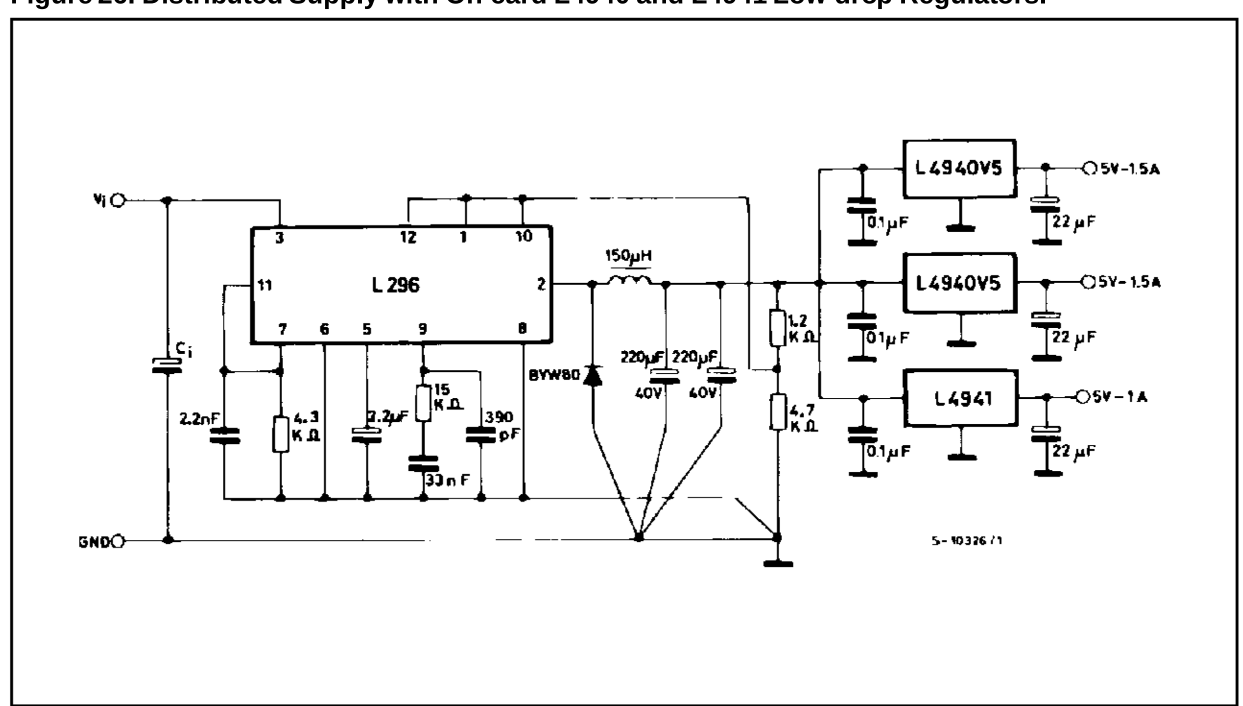


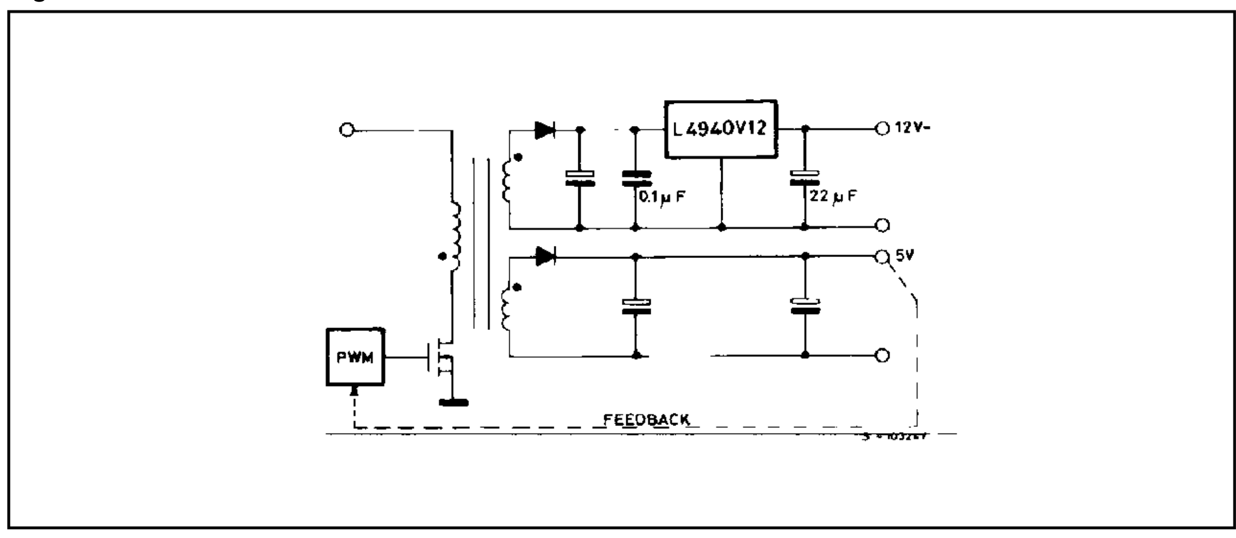
Figure 26. Distributed Supply with On-card L4940 and L4941 Low-drop Regulators.



ADVANTAGES OF THESE APPLICATIONS ARE :

- On card regulation with short-circuit and thermal protection on each output.
- Very high total system efficiency due to the switching preregulation and very low-drop postregulations.

Figure 27.

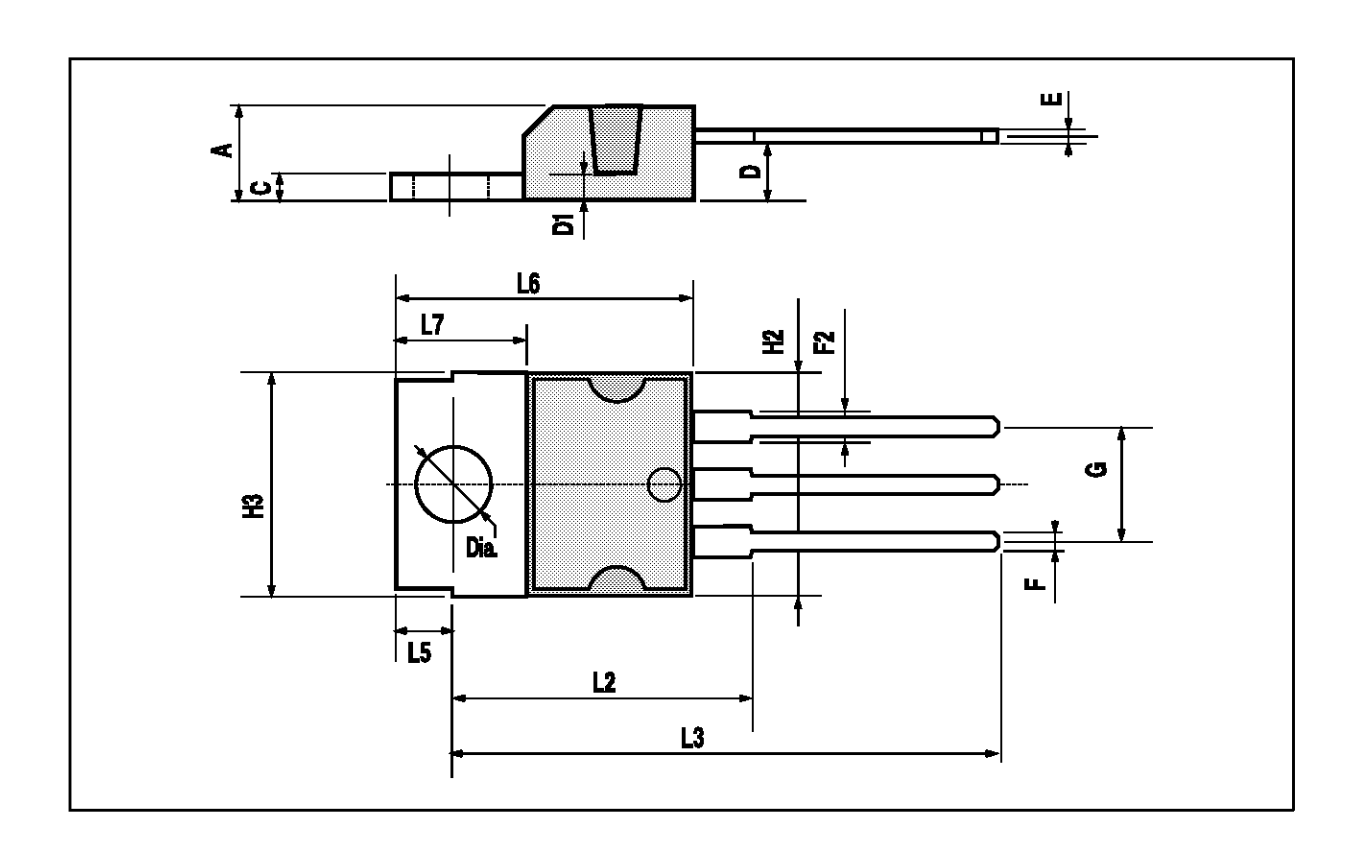


ADVANTAGES OF THIS CONFIGURATION ARE :

- Very high regulation (line and load) on both the output voltages.
- 12 V output short-circuit and thermally protected.
- Very high efficiency on the 12 V output due to the very low drop regulator.

TO220 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			4.8			0.189
C			1.37			0.054
D	2.4		2.8	0.094		0.110
D1	1.2		1.35	0.047		0.053
E	0.35		0.55	0.014		0.022
F	0.8		1.05	0.031		0.041
F2	1.15		1.4	0.045		0.055
G	4.95	5.08	5.21	0.195	0.200	0.205
H2			10.4			0.409
H3	10.05		10.4	0.396		0.409
L2		16.2			0.638	
L3	26.3	26.7	27.1	1.035	1.051	1.067
L5	2.6		3	0.102		0.118
L6	15.1		15.8	0.594		0.622
L7	6		6.6	0.236		0.260
Dia	3.65		3.85	0.144		0.152



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